

TIF-31735

Patent Amendment

REMARKS

This application has been carefully reviewed in light of the Office Action dated November 18, 2003. Applicants have amended claims 1, 8, 16 and 17. Reconsideration and favorable action in this case are respectfully requested.

The Examiner has rejected claims 1-19 under 35 U.S.C. §102(b) as being unpatentable over U.S. Pat. No. 5,838,583 to Varadarajan. Applicants have reviewed this reference in detail and do not believe that it discloses or makes obvious the invention as claimed.

As in the previous Office Action, the Examiner contends that the "clustering" disclosed in Varadarajan teaches assigning a fixed status to the datapath cells. Applicants disagree with this assertion. In a datapath region with no clustering (region 1102 of Figure 11 of Varadarajan), the datapath placer is free to swap the relative positions of any of datapath functions within the region (col. 15, lines 53-59). In a datapath region with clustering (region 1101 of Figure 11), certain functions are grouped into a cluster (functions 1109, 1110 and 1111) and the datapath placer must treat the functions as a unit and *can move this unit relative to relative to non-clustered datapath functions in the region 1101* (col. 15, lines 60-64). Hence, clustering does not fix any datapath function relative to standard cells – it only fixes datapath functions relative to *other datapath functions within a cluster*.

Claim 1 has the additional restriction that the routing of the datapath cells does not occur until after the step of transferring desired criteria regarding the other cells to the place and route tool and optimizing the layout based on said desired criteria, such that the datapaths cells are unmoved as different layout iterations are performed on the other cells. This claim has been amended to clarify that the optimization of the layout of the other (standard) cells occurs prior to routing.

TIF-31735

Patent Amendment

Placing the standard cells prior to routing provides significant additional flexibility in circuit layout optimization due to the availability of additional free area for the standard cells.

The Examiner cites column 3, lines 25-28 as teaching placement of the standard cells prior to routing the datapath. Applicants strongly disagree. The cited passage states:

Accordingly, it is desirable to provide a placement system that allows the circuit designer to cluster datapath functions, define constraints for net exits, and control the aspect ratio over the cell routing of the datapath functions.

First, Applicants does not believe that this passage provides any teaching that standard cell placement occurs before routing – it only describes datapath cell layout. Second, if the Examiner is contending this paragraph is describing a process flow, Applicants disagree. In the preceding paragraph (col. 3, lines 6-24), Varadarajan describes “three issues” that designers consider when performing layout of a circuit during floorplanning and during placement. The paragraph cited by the Examiner is simply a summary of the afore-stated three issues, and clearly does not provide any information about process flow.

Third, Varadarajan *explicitly* states that routing of the datapath cells occurs prior to placement of the standard cells. Figure 2 of Varadarajan clearly shows that datapath placing and routing (block 208) is performed prior to standard cell placement (block 205). The flowchart of Figure 2 is unambiguous as to this point.

For reasons stated above, Applicants also believe that claim 8 is novel and unobvious over Varadarajan, as well.

Accordingly, Applicants respectfully request allowance of independent claims 1 and 8, and dependent claims 2-7 and 9-19.

TIF-31735

Patent Amendment

With regard to the dependent claims, Applicants added claims 16-19 in the previous response to describe another feature not shown in Varadarajan. These claims have been amended in this response for proper antecedent basis. Regarding the subject matter of the claims, datapath cells are placed within matrices of slots ordered in rows and columns. Unused space may be provided between rows or columns (or both) such that open space is provided in the matrix (best shown in Figure 4 of the present specification). The space may thus be provided throughout the matrix for the remaining cells. By adjusting column and row spacing, free space 38 can be planned within the matrix to allow timing-driven placement of embedded standard cells along with the structured placement cells.

The Examiner has cited columns 16 and 17 as showing this feature. Applicants assume that the Examiner is referring to the section of Varadarajan entitled "Interleaving Functions", since the portion of "Creating Cluster" in column 16 would not appear to be applicable. Applicants believe that the function interleaving constraints described in Varadarajan are completely unrelated to the subject matter of claims 16 – 19. First, function interleaving is directed to *routing within datapath functions*, not to providing space for standard cells (col. 16, lines 58-65). Second, function interleaving is directed to the number of rows per bit to be used by the datapath placer (130) and routing space estimator (140), in order to increase the *over the cell* routing, not space that could be used for placement of standard cells. Third, the use of function interleaving to change the aspect ratio of a datapath region in order to fit in an available area (see Figures 15a-b) does not provide for space for standard cells.

Applicants have made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Alan W. Lintel, Applicants' Attorney at (972) 664-9595 so that such issues may be resolved as expeditiously as possible.

TIF-31735

Patent Amendment

The Commissioner is hereby authorized to charge any fees or credit any overpayment, including extension fees, to Deposit Account No. 20-0668 of Texas Instruments Incorporated.

For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,



Alan W. Lintel
Attorney for Applicant(s)
Reg. No. 32478

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Anderson, Levine & Lintel
14785 Preston Rd.
Suite 650
Dallas, Texas 75254
Tel. (972) 664-9595